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C. H. J. Bong and J. Richard

ABSTRACT

Severe droughts in the year 1998 and 2014 in Sarawak due to the strong El Nino has impacted the water supply and irrigated agriculture. In this study, the Standardized Precipitation Index (SPI) was used for drought identification and monitoring in Sarawak River Basin. Using monthly precipitation data between the year 1975 and 2016 for 15 rainfall stations in the basin, the drought index values were obtained for the time scale of three, six and nine months. Rainfall trend for the years in study was also assessed using the Mann–Kendall test and Sen's slope estimator and compared with the drought index. Findings showed that generally there was a decreasing trend for the SPI values for the three time scales, indicating a higher tendency of increased drought event throughout the basin. Furthermore, it was observed that there was an increase in the numbers of dry months in the recent decade for most of the rainfall stations as compared to the previous 30 to 40 years, which could be due to climate change. Findings from this study are valuable for the planning and formulating of drought strategies to reduce and mitigate the adverse effects of drought.

Key words | agriculture, climate change, drought index, precipitation, Standardized Precipitation Index (SPI)

C. H. J. Bong (corresponding author)
J. Richard
Department of Civil Engineering, Faculty of Engineering,
Universiti Malaysia Sarawak,
94300, Kota Samarahan, Sarawak,
Malaysia
E-mail: *bhjcharles@unimas.my*

INTRODUCTION

Drought is a natural hazard with large impacts on regular human activities, reduction of crop production and water shortages. Drought is linked to precipitation intensity, amount of precipitation occurrences and time scale between two wet seasons. The severe drought in 1998 was connected to the strong El Nino Southern Oscillation event, which affected millions of residents in Sarawak, Malaysia, caused high global temperatures, disrupted water supply in regional areas, caused forest fires and impacted irrigated agriculture. According to the World Meteorological Organization (WMO), six drought periods in Sarawak were during the periods 1982–1983, 1986–1988, 1991–1992, 1997–1998, 2009–2010 and 2014–2016 due to the strong El Nino.

There are several established scientific methods to identify and forecast drought occurrence, such as Standardized Precipitation Index (SPI), Palmer Severity Index, Crop Moisture Index and Reclamation Drought Index, which are commonly used to determine the drought indices. These drought index values incorporate thousands of data on rainfall, stream flow and other water resources indicators into an understandable large representation. Some indices are more suitable than others for certain uses, even though none of the main indices is essentially superior to the rest in all circumstances. Each of the indices works in a different way depending on the need that arises (Othman *et al.* 2016a).

Drought indices such as the SPI can be used to evaluate the impact of climate change on short- and medium-term

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